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MECHANICS.

Conducted by B. F. FINKEL, Kidder, Missouri. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

1. **Proposed by A. M. SCRIPTURE, A. M., Principal of Schools, New Hartford, New York.**

Suppose A and B to start at the same time from the same point in a level plane. A walks south, going 30 inches at a step, stepping twice in a second and beating a drum at the beginning of each step. B steps west 30 inches every time he hears the drum beat. How far apart will they be at the end of 15 minutes, if the temperature of the air is $+41^\circ$ Fahrenheit?

Solution by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.

The man who hears the drum beat always hears it at the extremity of the hypotenuse of an isosceles right triangle.

The length of the first hypotenuse is $\frac{30\sqrt{2}}{12}=\frac{5\sqrt{2}}{2}$ feet, of the second $\frac{60\sqrt{2}}{12}=\frac{10\sqrt{2}}{2}$ feet, of the third $\frac{15\sqrt{2}}{2}$ feet, and so on. Let a be the number of feet sound travels per second. Then $\frac{1}{2}+\frac{5\sqrt{2}}{2a}=$ the number of seconds from first beat till he hears the second beat;

$\frac{2}{2}+\frac{10\sqrt{2}}{2a}$ from the first till he hears the third beat;

$\frac{3}{2}+\frac{15\sqrt{2}}{2a}$ from the first till he hears the fourth beat;

$n\left(\frac{1}{2}+\frac{5\sqrt{2}}{2a}\right)$ from the first till he hears the $(n+1)$th beat.

But $\frac{n}{60}\left(\frac{1}{2}+\frac{5\sqrt{2}}{2a}\right)=15$ or $n=\frac{1800a}{a+5\sqrt{2}}$. $41^\circ F=\frac{5}{9}(41-32)=5^\circ C$. Velocity of sound at $0C^\circ$ and 760 mm. pressure $=1090$, hence velocity at $5C$ and 760 mm. pressure $=1090\sqrt{\frac{273+5}{273}}=1099.81$ feet.

$\therefore a=1099.81$ feet. $\therefore n=1780.5$.

$\therefore$ he takes 1781 steps plus the first step $=1782$.

$1782\times2\frac{1}{2}$ feet $=4455$ feet $=B$'s distance from starting point.

$1800\times2\frac{1}{2}$ feet $=4500$ feet $=A$'s distance from starting point.

$d=$ distance apart $=\sqrt{(4455)^2+(4500)^2}=6332.22$ feet.

[*Professor H. C. Whitaker* gets 6355.06 feet.]

2. **Proposed by WILLIAM SYMMONDS, A. M., Professor of Mathematics and Astronomy, Pacific College, Santa Rosa, California.**

The axis of a parabola coincides with a vertical line. What is the position of that focal chord through which a body would roll down in the least time?